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(54) **Folding fluorescent illumination system**

(57) An illuminator for a hand-held gaming or other electronic device is provided. The illuminator includes at least one light source contained within an enclosure that is mounted to a bracket. The bracket is notably mounted to a member secured to the gaming/electronic device. The bracket can be rotated into one position for

use and another position for storage. During non-use, the bracket is rotated into a compact area for ease of transport. A diffuse light source, comprises of the combination of a fluorescent light and a diffuser can be used to minimise "hot spots" on the screen of the gaming/electronic device.

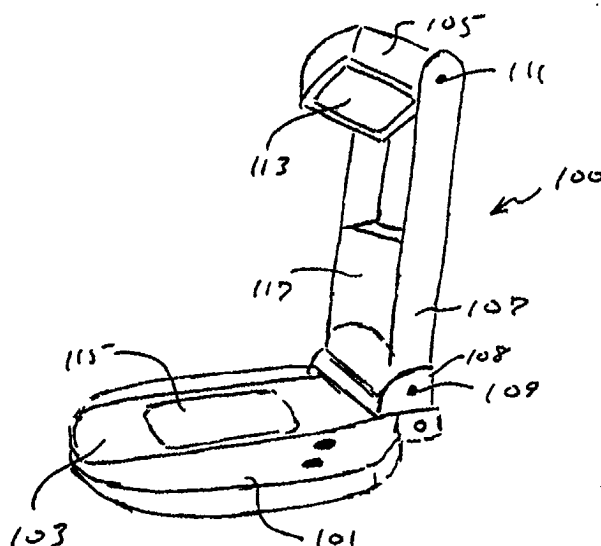


FIG. 1

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Description

FIELD OF THE INVENTION

[0001] This application relates generally to illumination systems for electronic devices, such as computing, telecommunication and gaming devices, and is particularly directed to illumination systems for hand-held gaming devices.

BACKGROUND OF THE INVENTION

[0002] Hand-held electronic devices, such as computing, telecommunication and gaming devices, are enjoying increasing popularity. Such devices, collectively referred to herein as "gaming devices", typically use a non-backlit liquid crystal display (LCD). This type of display can be difficult to see in low light conditions. In order to overcome this problem, battery powered illumination that can be coupled to the gaming device have become a popular accessory for such gaming devices.

[0003] Battery powered illuminators typically use an incandescent bulb, although some use a white or coloured light-emitting diode (LED). For example, in one such illuminator the light source is coupled to the gaming device by a projecting support or "stalk". The illuminator's stalk is positioned above the screen when in use and is folded across the top of the gaming device when not in use. A disadvantage of this design is that the illuminator occupies more space than desired when it is not in use, substantially increasing the overall height of the gaming device. As a consequence, the gaming device is not as convenient to carry. In addition, due to this design's single, non-diffuse light source, uneven illumination is provided, typically creating high glare "hot spots" on the device's screen.

[0004] In a second prior art illuminator utilising a stalk configuration, the device plugs into an expansion port of the gaming device, thereby eliminating the weight associated with a separate battery. A disadvantage of this approach is the higher battery drain placed on the gaming device's battery. Additionally, the designs still suffers from uneven illumination.

[0005] A third type of prior art illuminator includes an integrated magnification lens mounted over the display with a built-in light source. The third type of illuminator still has the drawback of uneven lighting.

SUMMARY OF THE INVENTION

[0006] An illuminator for a hand-held gaming or other electronic device is provided. The illuminator includes at least one light source, preferably a fluorescent light source, containing within an enclosure that is rotatably mounted to a bracket. The bracket is rotatably mounted to a member secured to the gaming/electronic device.

[0007] According to one aspect of the invention, during use the bracket is rotated away from the surface of

the gaming/electronic device. Preferably, the bracket and the light source enclosure can be positioned within a range of positions, thus allowing the user to locate the light in the best possible location during use. During non-use, the light source enclosure is rotated back into the bracket, and the bracket is rotated back against the bracket mount and the surface of the gaming/electronic device.

[0008] According to another aspect of the invention, glare and illumination "hot spots" are reduced, if not substantially eliminated, from the screen of the gaming/electronic device. In part, this is accomplished by allowing the light source to be positioned within a range of positions, including off-axis. Additionally, the preferred light source, a fluorescent light, produces diffuse light. Preferably the light enclosure interposes a window between the light source and the gaming device, the window further diffusing the light. In at least one embodiment of the invention, the bracket mounting member masks the screen of the gaming/electronic device and aids in the reduction of glare by means of both mounting material characteristics (e.g., colour, surface roughness) and geometry (e.g., sloped regions bordering the screen).

[0009] A further understanding of the nature and advantages of the present invention may be realised by reference to the remaining portions of the specification and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is an illustration of an embodiment of the invention attached to a gaming device, the illuminator positioned for use;

Fig. 2 is a cross-sectional view of the preferred embodiment of the illuminator system;

Fig. 3 is a top view of the mounting member of the illuminator shown in Fig. 2;

Fig. 4 is a cross-sectional view of the mounting member shown in Fig. 3 along plan A-A;

Fig. 5 is a cross-sectional view of the illuminator in its fully open position;

Fig. 6 is a cross-sectional view of the illuminator with the light source folded, but the light source bracket is unfolded;

Fig. 7 is an illustration of a preferred embodiment of a light housing for use with the illuminator; and

Fig. 8 schematically illustrates the preferred control circuit for the fluorescent illumination source used in the preferred embodiment of the invention.

DESCRIPTION OF THE SPECIFIC EMBODIMENTS

[0011] Fig. 1 is an illustration of an illuminator 100 in accordance with one embodiment of the invention. As shown, illuminator 100 is attached to a gaming device

101, such as a Game Boy Advance™ by Nintendo. It is understood that the present invention can also be used with other dedicated gaming systems such as Game Boy™ as well as personal digital assistants (PDAs), palm-top computers, and other electronic devices that may require external illumination to be useable under adverse lighting conditions. It will be appreciated that minor alternations to the means used to attach the illuminator to the gaming device may be required in order to utilise the invention with another device.

[0012] Illuminator 100 is comprised of a mounting member 103, a light housing 105, and a pivotable bracket 107. Bracket 107 pivots about pin 109, thus allowing the illuminator to be stored against gaming device 101 during non-use, and then re-positioned during use. Typically during use, bracket 107 is positioned at an angle of 90 degrees or less relative to mounting member 103. In a similar fashion, the light housing 105 may be pivotable about pin 111 or may be attached in a fixed position with respect to bracket 107 thus allowing the light transmitted through light window 113 to be further optimally positioned relative to screen 115 of device 101. During use, preferably light housing 105 is positioned at an angle of more than 90 degrees but less than 180 degrees relative to bracket 107, and more preferably at an angle of more than 90 degrees but less than 135 degrees relative to bracket 107. In preparation for storage, light housing 105 is pivoted such that it is flush or close to flush with bracket 107.

[0013] Fig. 2 is a cross-section view of illuminator 100, the illumination system being in a closed position. Accordingly, bracket 107 is pivoted about pin 109 such that face 201 of bracket 107 is adjacent to and approximately parallel with the top surface of mounting member 103.

[0014] Preferably means are included to insure that once a position has been selected for bracket 107 relative to mounting member 103, it does not accidentally move. For example, bracket 107 can be coupled to mounting member 103 via a pair of hinge members 108. If the fit between bracket 107 and hinge members 108 is sufficiently tight, friction will prevent accidental movement. Alternately, bracket 107 and hinge members 108 can include complementary sets of ridges and grooves or complementary sets of tabs and slots that prevent accidental movement. It will be understood that these techniques as well as others are well known techniques for maintaining the relative positions of two hinged members. Accordingly, further detail will not be provided. It will also be understood that these or other techniques can be used to maintain the position of light housing 105 relative to bracket 107.

[0015] Figs. 2 and 3 illustrate the preferred method of coupling illuminator 100 to a gaming device (not shown). Fig. 3 is a top view of mounting member 103. Note that in order to better illustrate the preferred coupling method, bracket 107 and light housing 105 are not shown in Fig. 3.

[0016] Attached to the back surface of mounting

member 103 is a pair of coupling members 203. Protruding from each coupling member 203 is a pin 205. When illuminator 100 is attached to a gaming device (not shown), pins 205 are inserted into complementary openings within the body of the gaming device. To insure a secure fit between mounting member 103 and the gaming device, the body of the gaming device is captured between surfaces 207 of coupling members 203 and flange 209. In at least one embodiment of the invention, flange 209 includes a portion 211 that curves under the lower face of the gaming device, thus further securing mounting member 103 to the device. Similarly, in at least one embodiment, each coupling member 203 includes a flange 212 that curves under the lower face of the gaming device adjacent to members 203.

[0017] In a preferred embodiment of the invention, pins 205 are compressible, thus allowing member 203 to be easily fit to the gaming device without requiring that it be bent, bowed, or otherwise deformed during mounting. Preferably pins 205 are spring loaded, for example by locating a spring in each coupling member 203 on axis with the pins, the springs placing the pins under tension. In at least one embodiment, pins 205 can be locked into place, thus securing member 103 in place by insuring that the pins cannot be accidentally retracted, for example by a sudden jolt during game transport. Push button releases (e.g., buttons 213) can be used to release or reduce spring tension on pins 205, thus allowing easy coupling and uncoupling of the illuminator from the gaming device. If the embodiment allows pins 205 to be lockable, preferably buttons 213 release the pin locks.

[0018] In at least one embodiment of the invention, the end portion of each pin 205 is hooked, thus providing a means of locking the pins and illuminator to the gaming device. Preferably springs are used to insure that the hooked portions remain in place. In this embodiment, buttons 213 are used to apply off-axis pressure to pins 205, thus providing a means of unhooking the hooked portions from the gaming device and allowing the illuminator to be uncoupled from the gaming device.

[0019] It will be appreciated that other means can be used to couple illuminator 100 to a gaming device. For example, the number, size and location of pins 205 can be altered to match complementary openings within the gaming device. Other mounting means may rely solely on the gaming device being held in place between multiple mounting member tabs or brackets. Still other mounting means may utilize straps, preferably elastic straps.

[0020] Fig. 4 is a cross-sectional view of the mounting member shown in Fig. 3 along plane A-A. Gaming device 101 and gaming device screen 115 are shown in phantom. In a preferred embodiment of the invention, mounting member 103 masks the edge of gaming device 101 surrounding gaming device screen 115, thus eliminating reflections from this area of the gaming device. Preferably at least this portion of mounting member

103 is made of a material of low reflectivity, thus helping to minimize reflections. Also preferably, the edge of member 103 bordering screen 115 is sufficiently thick to include a sloped portion 401. Sloped portion 401 helps to further reduce the glare on screen 115. Potential sources of screen glare include light from illuminator 100 as well as ambient light.

[0021] Figs. 5 and 6 are cross-sectional views of illuminator 100, initially in its fully open position (i.e., Fig. 5), and then with the light source folded, but the light source bracket unfolded (i.e., Fig. 6). Previously described Fig. 2 shows illuminator 100 in the fully closed position.

[0022] Fig. 7 is an illustration of a preferred embodiment of light housing 105. Within light housing 105 is at least one fluorescent light source 701, preferably a fluorescent tube approximately 50 millimeters long. It is understood that more than one fluorescent light source can be used as well as other sizes. The benefit of using a fluorescent light sources that it creates a more diffuse light than either an LED or an incandescent light, thus dramatically reducing 'hot spots' on screen 115. To further reduce hot spots, window 113 is preferably roughened, frosted, or otherwise treated to further diffuse the light emitted by fluorescent source 701.

[0023] The electronics necessary to control source 701 are preferably housed within portion 703 of light housing 701, although it is understood that the electronics can be housed in other locations such as portion 117 of bracket 107. Preferably portion 117 houses a battery supply for source 701. The on/off switch for source 701 is preferably located on portion 117 as well.

[0024] Fig. 8 schematically illustrates the preferred control circuit for source 701. It will be appreciated by those of skill in the art, that other circuits can be used to supply power to, and control of, source 701. For example, a RangeMAX® controller such as the LX1689 from Microsemi can be used.

[0025] As will be understood by those familiar with the art, the present invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. For example, the means by which the illumination system is coupled to the gaming or other electronic device, the means by which the illumination source is positioned relative to the screen of the gaming or other electronic device, and the circuit or power source used in conjunction with the illumination source, are not limited to those means and circuits specifically disclosed. Accordingly, the disclosures and descriptions herein are intended to be illustrative, but not limiting, of the scope of the invention which is set forth in the following claims.

[0026] In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

[0027] The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms

of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. An illuminating apparatus for a hand-held electronic device, comprising:

a mounting member configured to be attached to the hand-held electronic device;

a bracket rotatably coupled to said mounting member, the bracket rotatable between a first bracket position and second bracket position; a light source enclosure carried on said bracket; and

at least one fluorescent light mounted within said light source enclosure.

2. An illuminating apparatus according to Claim 1, wherein the bracket is rotatably coupled to said bracket, the light source enclosure rotatable between a first light source enclosure position and a second light source enclosure position.

3. An illuminating apparatus according to Claim 1 or 2, wherein a diffuse window is mounted to said light source enclosure, wherein light emitted from said at least one fluorescent light passing through said diffuse window prior to illuminating the hand-held electronic device.

4. The illuminating apparatus of any preceding claim, wherein a bracket surface is approximately perpendicular to a mounting member surface when said bracket is positioned at said first bracket position.

5. The illuminating apparatus of Claim 4, wherein said bracket surface is approximately parallel to said mounting member surface when said bracket is positioned at said second bracket position.

6. The illuminating apparatus according to Claim 3, wherein a diffuse window surface is at an angle greater than 90 degrees to a bracket surface when said light source enclosure is positioned at said first light source enclosure position.

7. The illuminating apparatus of Claim 6, wherein said diffuse window surface is approximately parallel to said bracket surface when said light source enclosure is positioned at said second light source enclosure position.

8. The illuminating apparatus of any preceding claim,

wherein said mounting member includes an edge portion defining an opening in said mounting member, said opening surrounding a display screen of the hand-held electronic device when said mounting member is attached to the hand-held electronic device. 5

9. The illuminating apparatus of Claim 8, wherein said edge portion of said mounting member masks a reflective surface surrounding said display. 10

10. The illuminating apparatus of Claim 8 or 9, wherein an edge corresponding to said mounting member opening is sloped. 15

11. The illuminating apparatus of any preceding claim, wherein said mounting member is comprises of an electronic device coupler.

12. The illuminating apparatus of Claim 11, wherein said electronic device coupler includes a pair of locating pins. 20

13. The illuminating apparatus of Claim 11 or 12, wherein each of said locking pins includes a hooked portion. 25

14. An illuminating apparatus for a hand-held electronic device, comprising: 30

a mounting member configured to be attached to the hand-held electronic device;
 a bracket rotatably coupled to said mounting member, the bracket rotatable between a first bracket position and a second bracket position, wherein a bracket surface is approximately perpendicular to a mounting member surface when said bracket is positioned at said first bracket position, and wherein said bracket surface is approximately parallel to said mounting member surface when said bracket is positioned at said second bracket position.; 35
 a light source enclosure rotatably coupled to said bracket, the light source enclosure rotatable between a first light source enclosure position and a second light source enclosure position, wherein a diffuse window surface is at an angle greater than 90 degrees to a bracket surface when said light source enclosure is positioned at said first light source enclosure position, and wherein said diffuse window surface is approximately parallel to said bracket surface when said light source enclosure is positioned at said second light source enclosure position; 40
 at least one fluorescent light mounted within said light source enclosure; and 45
 a diffuse window mounted to said light source enclosure, wherein light emitted from said at 50 55

least one fluorescent light passes through said diffuse window prior to illuminating a display screen of the hand-held electronic device.

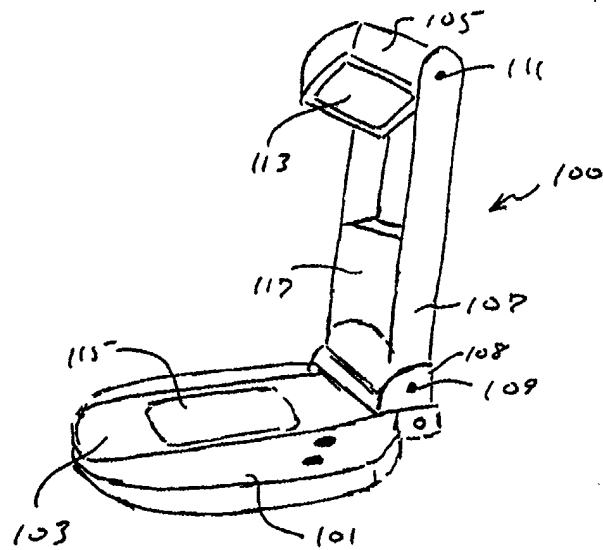


FIG. 1

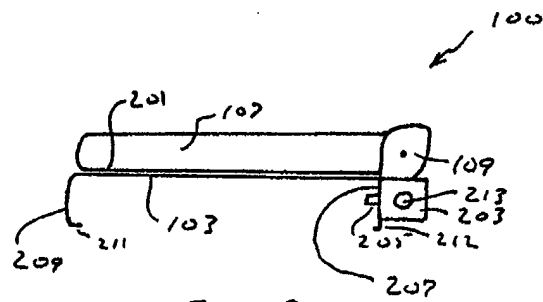


FIG. 2

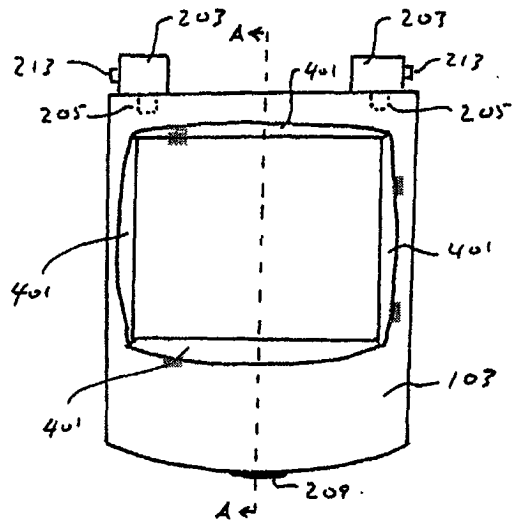


FIG. 3

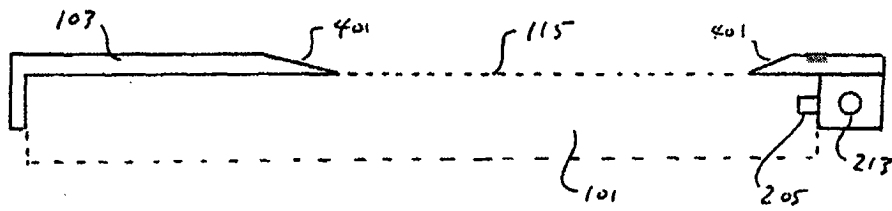


FIG. 4

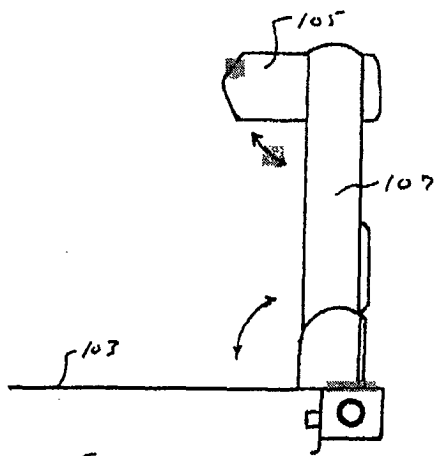


FIG. 5

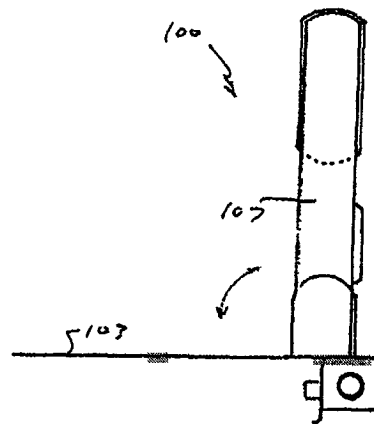


FIG. 6

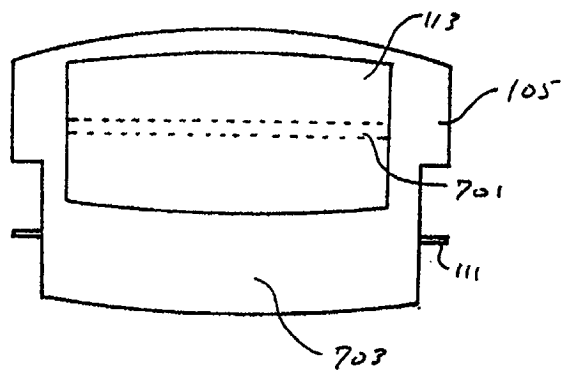


FIG. 7

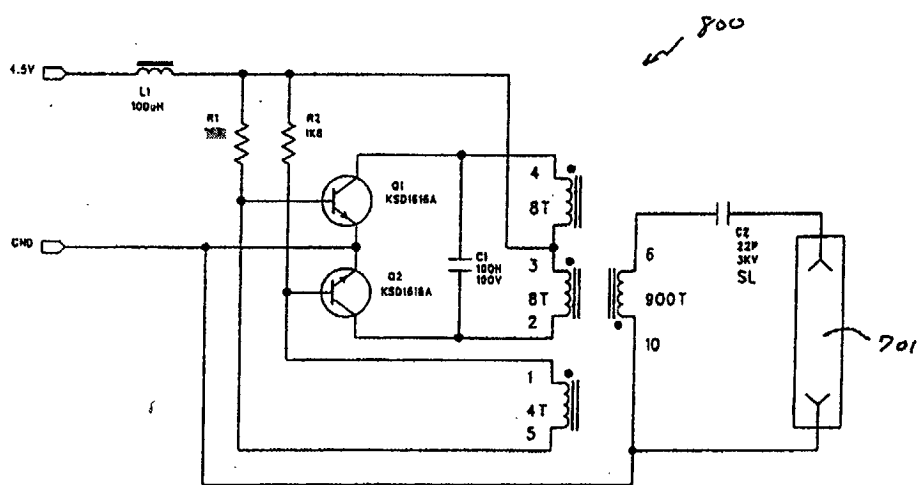


FIG. 8